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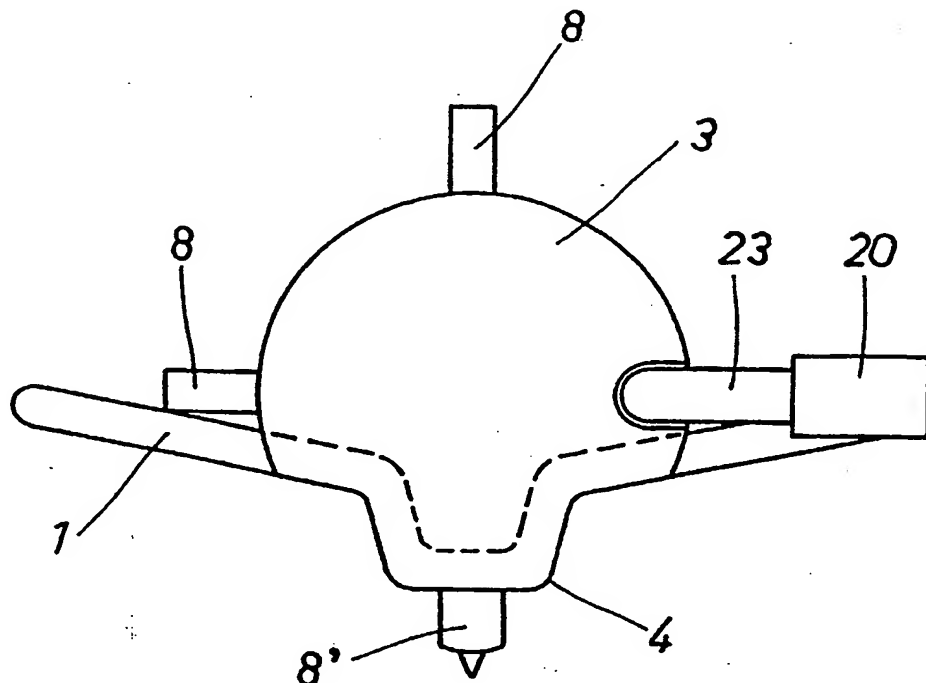
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>7</sup> : B62M 27/02 // B52B 13/09, B62D 15/00, 55/06</p>	<p>A1</p>	<p>(11) International Publication Number: WO 00/61431 (43) International Publication Date: 19 October 2000 (19.10.00)</p>
<p>(21) International Application Number: PCT/FI00/00315 (22) International Filing Date: 14 April 2000 (14.04.00) (30) Priority Data: 990820 14 April 1999 (14.04.99) FI (71) Applicant (for all designated States except US): DESTAR OY [FI/FI]; Tuomaankuja 3 A 2, FIN-42300 Jämsänkoski (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): VUOLLE-APIALA, Antti [FI/FI]; Tuomaankuja 3 A 2, FIN-42300 Jämsänkoski (FI). (74) Agents: KAUSTE, Markku et al.; Leitzinger Oy, Ruoholah- denkatu 8, FIN-00180 Helsinki (FI).</p>		<p>(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. In English translation (filed in Finnish).</p>

(54) Title: ARRANGEMENT IN A SNOWMOBILE EQUIPPED WITH AN APPARATUS FOR INTENSIFYING STEERING

(57) Abstract

The invention relates to an arrangement in a snowmobile equipped with an apparatus for intensifying steering, which intensifying apparatus consists of the ski (1) of the snowmobile, which comprises a drum (3) rotated by means of actuators (2), the drum forming at least a part of the bearing surface (4) of the ski (1), the rotation axis (5) of the drum (3) being fitted with bearings in such a way that when the drum (3) rotates, the circumferential surface (6) of the drum moves transversely with respect to the longitudinal axis of the ski (1), and which drum (3) is provided with one or more ridges (8, 8') protruding from its circumferential surface (6), the ridges being essentially parallel with the rotation axis (5) of the drum (3). The drum (3) is provided with one or more locking means (20) preventing the rotation of the drum (3), the locking means being arranged to lock the drum (3) into a predetermined position when the apparatus for intensifying steering is not used and, correspondingly, to allow the drum (3) to rotate when the apparatus for intensifying steering is used.



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## Arrangement in a snowmobile equipped with an apparatus for intensifying steering

The invention relates to an arrangement in a snowmobile equipped with an apparatus for intensifying steering, which intensifying apparatus consists of the ski of the snowmobile, which comprises a drum rotated by means of actuators, the drum forming at least a part of the bearing surface of the ski, the rotation axis of the drum being fitted with bearings in such a way that when the drum rotates, the circumferential surface of the drum moves transversely with respect to the longitudinal axis of the ski, and which drum is provided with one or more ridges protruding from its circumferential surface, the ridges being essentially parallel with the rotation axis of the drum.

The type of snowmobile mentioned above, which is equipped with an apparatus for intensifying steering, is known from the Finnish patent 102364 (Vuolle-Apiala). In this known solution, the starting point was to ensure proper turning capabilities of the snowmobile in all possible conditions. Especially on hard and icy surfaces, the turning capabilities of a snowmobile are known to be very poor and the turning radius usually becomes extremely large. In the known solution, this problem has been eliminated by attaching a rotatable drum to the ski, by means of which drum is effected lateral movement of the ski on hard surfaces. The rotatable drums have eliminated the said problem concerning turning capabilities as such, but at the same time compromises have had to be made as far as normal driving with the snowmobile is concerned. Problems are especially the considerable weight of the drums and, on the other hand, the snowmobile's impaired advancing capacity when driving in the conventional manner, that is, when the intensifying apparatus is not used, because compromises have had to be made in the optimal design of the ski due, on the one hand, to the structure rotating freely during normal operation of the drum and, on the other, to the rotation-symmetrical design of the drum.

The object of the invention is to eliminate the said defects in the known structure.

This object is achieved by means of the arrangement relating to the invention, of which arrangement it is characteristic that the drum is provided with one or more locking means preventing the rotation of the drum, the locking means being arranged to lock the drum into a predetermined position when the apparatus for intensifying steering is not used and, correspondingly, to allow the drum to rotate when the apparatus for intensifying steering is used.

The solution relating to the invention makes it possible for one of the ridges to extend through the bottom of the ski, corresponding to the conventional bottom iron of the ski, when the drum is locked. The arrangement may also be such that only one ridge is designed and made to be such that it will withstand the strains occurring in normal driving of the snowmobile. In such a case, locking is arranged to take place only when the said ridge is at the desired point. Other ridges can be made structurally weaker and thus lighter. It should, however, be noted in particular that in the arrangement relating to the invention, a fully satisfactory solution may in some cases be achieved by using only one ridge per drum.

Irrespective of the number of ridges, in this case, the normal shape of the bottom of the ski is then very nearly achieved. Another preferred embodiment of the invention comes even closer to the normal shape of the bottom of the ski in which it has been arranged that in at least one locking position of the drum, that part of the drum which forms a part of the bearing surface of the ski is designed to substantially correspond to the shape of the bottom of the ski.

The invention is described in greater detail in the following with reference to the appended drawings, in which

Figure 1 shows a diagrammatic side view of a snowmobile equipped with prior art apparatus for intensifying steering.

Figure 2 shows a section along line II-II of Figure 1.

Figure 3 shows a diagrammatic side view of a ski provided with the arrangement relating to the invention.

Figure 4 shows a section along line IV-IV of Figure 3.

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Figure 5 shows a section according to Figure 4 when the drum is in the unlocked position.

Both skis of the snowmobile shown diagrammatically in Figures 1 and 2 are provided with a drum 3 known from the prior art which is rotatable by means of an actuator 2, most conveniently by means of an electric motor 2. The drum 3 forms at least a part of the bearing surface 4 of the ski 1. The rotation axis 5 of the drum 3 is fitted with bearings in such a way that when the drum 3 rotates, the circumferential surface 6 of the drum moves transversely with respect to the longitudinal axis of the ski 1.

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The drum 3 is fitted with bearings to the ski 1 or a supporting structure 7 of the ski.

The drum 3 is provided with ridges 8 protruding from its circumferential surface 6, which ridges are essentially parallel with the rotation axis 5 of the drum 3. In different positions of the drum 3, at least one ridge 8 extends at least partly through the bottom 4 of the ski 1 each time.

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The actuator of the drum 3 consists of an electric motor 2 arranged inside the drum 3. The electric motor 2 is fixed to the end of a shaft 9 which is concentric with the rotation axis 5 of the drum 3 and arranged non-rotatably with respect to the ski 1. The motor 2 rotates shaft 10 by means of a gear reducer, the said shaft in turn rotating the drum 3. At its rear end, the drum 3 is fitted with bearings on shaft 9 and at its front end on shaft 10 extending from the drum 3 to the supporting structure 7 of the ski 1. In the solution shown in the drawing, the main part of the supporting structure 7 is formed by the casing surrounding the drum 3 from above.

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The snowmobile is normally steered by turning the handlebar but if it is desirable to turn the snowmobile quickly on a hard base, for example on an icy surface, one of two switches 11 is pressed, whereby the drums 3 begin to rotate in the direction in question. Similarly, when the other switch 11 is pressed, the drums 3 will rotate in the opposite direction.

Figures 3 to 5 show an exemplifying embodiment of the arrangement relating to the invention. In Figures 1 to 5 are used the same reference numerals for corresponding parts.

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The drum 3 shown in Figures 3 to 5 may be fitted with bearings in the manner disclosed in connection with Figures 1 and 2. In the example shown in Figures 3 to 5, the actuator 2 rotating the drum 3, for example, via a chain 21 is arranged outside the drum 3, but the actuator 2 may obviously also be inside the drum 3. The actuator 2 is preferably comprised of a battery-driven screwdriver or the like.

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The essential aspect of the arrangement relating to the invention is that the drum 3 is provided with a locking member 20 which prevents the rotation of the drum 3. The locking member is arranged to lock the drum 3 into a predetermined position when the apparatus for intensifying steering is not used and, correspondingly, to allow the rotation of the drum 3 when the apparatus for intensifying steering is used.

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In practice, as a locking member 20 may act, for example, a locking solenoid, which is solidly fitted to the ski 1. On the circumference of the drum 3 is arranged a recess or groove 22 for the locking solenoid 20 at such a point that when the drum is in a predetermined position, the locking pin 23 of the locking solenoid 20 can penetrate into the recess or groove 22 and prevent the drum 3 from rotating. There may be one or more locking points.

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The operation of the locking solenoid 20 is preferably arranged in such a way that when the apparatus for intensifying steering is used, the locking solenoid

20 pulls the locking pin 23 out of the recess or groove 22 and, correspondingly, when the apparatus for intensifying steering is not used, the locking solenoid 20 releases the locking pin 23, whereby, due to the effect of a spring (not shown) inside the locking solenoid 20, the said pin is pushed against the outer circumference of the drum 3. Since the drum 3 is able to move freely during driving, the drum is rotated after a very short driving distance into such a position that the locking pin 23 penetrates into the recess or groove 22 and thus prevents the drum from rotating until the apparatus for intensifying steering is again used.

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The drum 3 and the ridges 8, 8' on it are dimensioned in such a way that when the drum 3 rotates, the ridges 8, 8', corresponding to a conventional bottom iron of the ski 1, extend in turn through an opening made for the drum 3 on the bottom of the ski 1.

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The locking position or locking positions of the drum 3 must be selected in such a way that one of the ridges 8, 8' is placed into a position corresponding to the conventional bottom iron of the ski 1 when the drum is locked. Since, however, extremely strong forces and strains are exerted on the bottom iron of the ski, it is advantageous to arrange only one ridge 8' to meet the requirements set on the bottom iron and to arrange for locking to take place only when the said ridge 8' is at the desired point. This means that the other ridges can be made of a substantially weaker material, thus making the drum as a whole essentially lighter.

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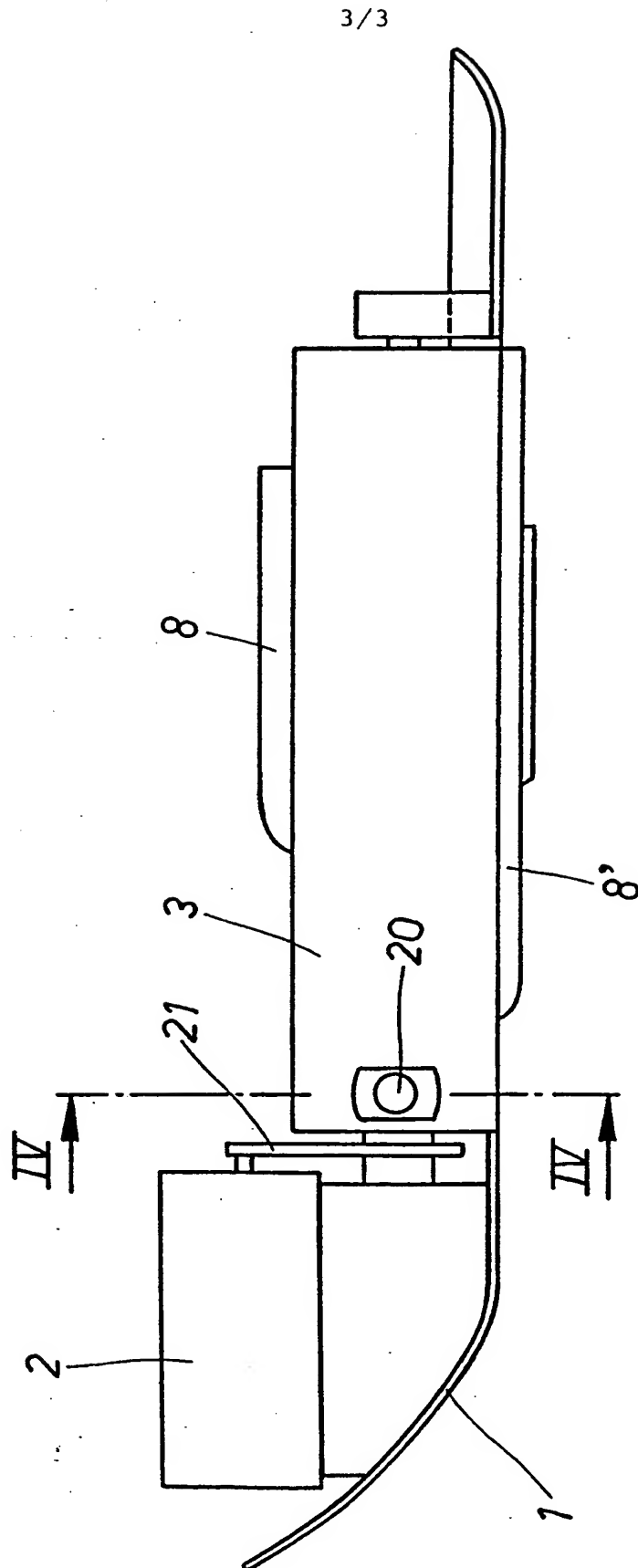
Although already by the fact that the drum 3 is locked in such a way that any of the ridges 8, 8' is in a position corresponding to the conventional bottom iron can very nearly be accomplished the original shape of the bottom of a ski 1 it is, however, most preferable to arrange so that, in at least one locking position of the drum, that part of the drum which forms a part of the bearing surface 4 of the ski is designed to correspond substantially to the shape of the ski bottom. This solution results in the drum 3 in practice not affecting the normal operation of the ski 1 at all.

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The invention is described above with reference to only one of its preferred exemplifying embodiments. It should, however, be noted that the invention can be modified in various ways which means that, for example, the drum 3 as a whole can be designed in such a way that it will form a ski 1 already as such.

Claims

1. An arrangement in a snowmobile equipped with an apparatus for intensifying steering, which intensifying apparatus consists of the ski (1) of the snowmobile, which comprises a drum (3) rotated by means of actuators (2), the drum forming at least a part of the bearing surface (4) of the ski (1), the rotation axis (5) of the drum (3) being fitted with bearings in such a way that when the drum (3) rotates, the circumferential surface (6) of the drum moves transversely with respect to the longitudinal axis of the ski (1), and which drum (3) is provided with one or more ridges (8, 8') protruding from its circumferential surface (6), the ridges being essentially parallel with the rotation axis (5) of the drum (3), **characterised** in that the drum (3) is provided with one or more locking means (20) preventing the rotation of the drum (3), the locking means being arranged to lock the drum (3) into a predetermined position when the apparatus for intensifying steering is not used and, correspondingly, to allow the drum (3) to rotate when the apparatus for intensifying steering is used.
2. An arrangement as claimed in claim 1, **characterised** in that in at least one locking position of the drum (3) the ridge (8, 8') is arranged, corresponding to a conventional bottom iron of the ski (1), to extend at least partly through an opening made for the drum (3) on the bottom of the ski (1).
3. An arrangement as claimed in claim 1 or 2, **characterised** in that in at least one locking position of the drum (3), that part of the drum (3) which forms a part of the bearing surface (4) of the ski (1) is designed to substantially correspond to the shape of the bottom of the ski (1).
4. An arrangement as claimed in claim 1, **characterised** in that the drum (3) forms the ski (1).



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00315

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B62M 27/02 // B52B 13/09, B62D 15/00, B62D 55/06  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B62M, B62D, B62B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FI 102364 B (VUOLLE-APIALA, ANTTI), 30 November 1998 (30.11.98), claims 1-6, abstract	1-4
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A	US 5109941 A (THOMPSON), 5 May 1992 (05.05.92), figure 4, abstract	1-4
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A	GB 1152155 A (POCLAIN), 14 May 1969 (14.05.69), figure 2	1-4
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

7 July 2000

Date of mailing of the international search report

25-07-2000

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FI	102364	B	30/11/98	FI 950963 A	20/12/96
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GB	1152155	A	14/05/69	BE 769276 A	03/11/71
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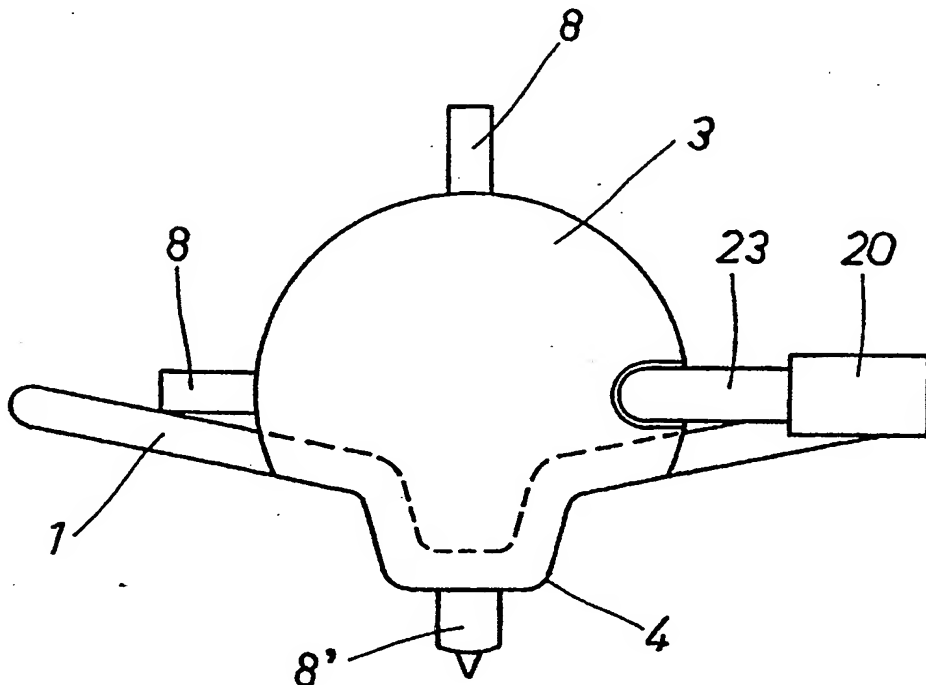
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<b>(51) International Patent Classification 7 :</b> <b>B62M 27/02 // B62D 13/09, 15/00,</b> <b>55/06</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/61431</b> <b>(43) International Publication Date:</b> 19 October 2000 (19.10.00)
<b>(21) International Application Number:</b> PCT/FI00/00315 <b>(22) International Filing Date:</b> 14 April 2000 (14.04.00) <b>(30) Priority Data:</b> 990820 14 April 1999 (14.04.99) FI <b>(71) Applicant (for all designated States except US):</b> DESTAR OY [FI/FI]; Tuomaankuja 3 A 2, FIN-42300 Jämsänkoski (FI). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> VUOLLE-APIALA, Antti [FI/FI]; Tuomaankuja 3 A 2, FIN-42300 Jämsänkoski (FI). <b>(74) Agents:</b> KAUSTE, Markku et al.; Leitzinger Oy, Ruoholah- denkatu 8, FIN-00180 Helsinki (FI).		<b>(81) Designated States:</b> AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With a revised version of the international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Finnish)</i>  <b>(88) Date of publication of the revised version of the international search report:</b> 23 November 2000 (23.11.00)

**(54) Title:** ARRANGEMENT IN A SNOWMOBILE EQUIPPED WITH AN APPARATUS FOR INTENSIFYING STEERING

**(57) Abstract**

The invention relates to an arrangement in a snowmobile equipped with an apparatus for intensifying steering, which intensifying apparatus consists of the ski (1) of the snowmobile, which comprises a drum (3) rotated by means of actuators (2), the drum forming at least a part of the bearing surface (4) of the ski (1), the rotation axis (5) of the drum (3) being fitted with bearings in such a way that when the drum (3) rotates, the circumferential surface (6) of the drum moves transversely with respect to the longitudinal axis of the ski (1), and which drum (3) is provided with one or more ridges (8, 8') protruding from its circumferential surface (6), the ridges being essentially parallel with the rotation axis (5) of the drum (3). The drum (3) is provided with one or more locking means (20) preventing the rotation of the drum (3), the locking means being arranged to lock the drum (3) into a predetermined position when the apparatus for intensifying steering is not used and, correspondingly, to allow the drum (3) to rotate when the apparatus for intensifying steering is used.



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INTERNATIONAL SEARCH REPORT

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Date of the actual completion of the international search

7 July 2000

Date of mailing of the international search report

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				US 3465843 A	09/09/69